

REMARKS/ARGUMENTS

Reconsideration of the application is requested.

Claims 1-6 remain in the application.

In item 2 on page 2 of the above-mentioned Office action, claims 1 and 5-6 have been rejected as being unpatentable over Fujishima (US Pat. No. 6,066,863) in view of Burke (US Pat. 5,793,070) under 35 U.S.C. § 103(a).

As will be explained below, it is believed that the claims were patentable over the cited art in their original form and the claims have, therefore, not been amended to overcome the references.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

Claim 1 calls for, inter alia:

a low-doped semiconductor substrate of a first conductivity type;

a low-doped drift zone of the first conductivity type formed in said low-doped semiconductor substrate; and

a first highly doped well zone of the first conductivity type and a second highly doped well zone of a second conductivity type, opposite to the first conductivity

type, successively disposed between said drift zone and said semiconductor substrate providing an electrical PN insulation.

In the Office action, the Examiner has compared the exemplary embodiment of Fig. 4 of Fujishima with the invention of the instant application. According to the Examiner's opinion, with the exception of the high doping of the well zone, all of the features of claim 1 of the instant application can be found in Fujishima.

However, Applicant disagrees because, if the exemplary embodiment of Fig. 4 of Fujishima were compared with Fig. 1 of the instant application, the following zones can be compared:

Fujishima

Invention of the
instant application

p-conductive substrate 401	n ⁻ -conductive substrate 1
n-conductive well 403	p ⁺ -conductive well 9
p-conductive well 406	n ⁺ -conductive well 8
n-conductive base 408	n ⁻ -conductive base 2
p-conductive base 407	p-conductive base 4
n-conductive emitter 415	n ⁺ -conductive emitter 5
p-conductive anode zone 414	p-conductive anode zone 6

This results in the following important differences between the invention of the instant application and Fujishima:

- (a) The well zones (8, 9) of the invention of the instant application are highly doped, while clearly a "normal" doping is present in Fujishima.
- (b) The substrate (1) in the invention of the instant application has the same conductivity type as the base zone (2) forming the drift zone, while in Fujishima the substrate 401 is p-doped and the drift zone has the opposite conductivity type in the n-base zone 408.
- (c) There is one pn-junction between the well zones (8, 9) in the invention of the instant application. This means that the well (8), which borders the n⁻-conductive drift zone (2), has the same conductivity type as the drift zone (2). In contrast, in Fujishima the zone 406 has a conductivity type p opposite to the drift zone 408 (n-base). Thus, there are two pn-junctions in Fujishima, i.e., between the n-base 408 and the p-well 406 and between the p-well 406 and the n-well 403. In Fujishima and the invention of the instant application, there is another pn-junction between the n-well 403 and the p-substrate 401 or between the p⁺-well (9) and the n⁻-substrate (1), respectively.

The above differences are clearly expressed in claim 1 of the instant application. The two well zones (8, 9) are indicated as being highly-doped, the semiconductor substrate (1) has the same conductivity type as the drift zone (2) and the first well zone (8) also has the same conductivity type as the drift zone (2).

The Examiner has stated that a person skilled in the art can easily combine the teaching of Burke with Fujishima to arrive the invention of the instant application because Burke contains the knowledge that a change of the doping of semiconductor layers changes their specific resistance.

In fact, the above knowledge that a change of the doping means a change of the specific resistance is so commonly known that proof by a document does not seem necessary. The text passage (col. 6, lines 36 to 39) in Burke cited by the Examiner points out that "selected regions 156 of polysilicone are highly doped and form the gates. The un-doped regions 157 may be slightly doped to adjust their resistance for purposes of minimizing power dissipation or improving the speed of the device." The regions 156, 157 are shown in Fig. 15A and form the gates of a CCD.

If a person skilled in the art applies the teaching of Burke (high doping = low resistance; low doping = high resistance) to the state of the art of Fujishima, he or she will only, if at all, think about the doping of the well zone 403, 406.

Should he or she come to the conclusion that these zones could possibly also be more highly doped, he or she still does not arrive to the invention of the instant application because in the invention of the instant application the drift zone and the substrate have the same conductivity type and the well zone bordering the drift zone also has the same conductivity type as the drift zone.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claim 1. Claim 1 is, therefore, believed to be patentable over the art and since claims 5-6 are dependent on claim 1, they are believed to be patentable as well.

In item 3 on page 3 of the above-mentioned Office action, claim 2 has been rejected as being unpatentable over Fujishima in view of Burke and further in view of Shekar et al. (US Pat. 5,317,171) under 35 U.S.C. § 103(a).

As discussed above, claim 1 is believed to be patentable over the art. Since claim 2 is dependent on claim 1, it is believed to be patentable as well.

In addition, Shekar et al. describe a thyristor in a vertical structure, i.e., a band element without an insulation well, which has nothing to do with an IGBT having a lateral structure which has an insulation well.

Applicants acknowledge the Examiner's statement in item 4 on page 3 of the above-mentioned Office action that claims 3-4 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Since claim 1 is believed to be patentable as discussed above and claims 3-4 are dependent on claim 1, they are believed to be patentable in dependent form. A rewrite is therefore believed to be unnecessary at this time.

In view of the foregoing, reconsideration and allowance of claims 1-6 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate a telephone call